ROTATION PERIOD DETERMINATION FOR 3157 NOVIKOV AND 7485 CHANGCHUN

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Collaborative photometric observations of two main-belt asteroids were conducted from five observatories in order to determine their synodic rotation periods. For 3157 Novikov we found a period of 9.952 ± 0.001 h with an amplitude of 0.31 ± 0.04 mag, for 7485 Changchun we found a period of 10.234 ± 0.001 h with an amplitude of 0.39 ± 0.02 mag.

CCD photometric observations of two main-belt asteroids were carried out in 2018 October-December at the Astronomical Observatory of the University of Siena (K54), a facility inside the Department of Physical Sciences, Earth and Environment (DSFTA, 2019), at Wild Boar Remote Observatory (K49) in San Casciano in Val di Pesa (Florence), at Osservatorio Astronomico di Tavolaia (A29) in Santa Maria a Monte (Pisa), at Znith Observatory in Naxxar and at Flarestar Observatory (171) in San Gwann. Table I shows the main features of the instruments used at the observatories involved in the research while Table II gives the observation circumstances and results.

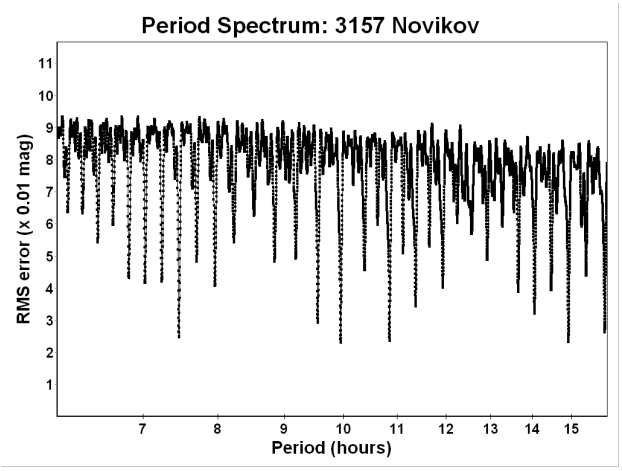
Obs.	Telescope	Filter	CCD
K54	0.30 m f/5.6 MCT	Clear	SBIG STL-6303 2x2 2.3”/pixel
K49	0.24 m f/10 SCT	Clear	SBIG ST8-XME 2x2 1.6”/pixel
A29	0.40 m f/5 NEW	Clear	Kaf-260 1x1 2.1”/pixel
Znith	0.20 m f/10 SCT	Clear	Moravian G2-1600 1x1 1.2”/pixel
171	0.25 m f/10 SCT	Clear	Moravian G2-1600 1x1 1.0”/pixel

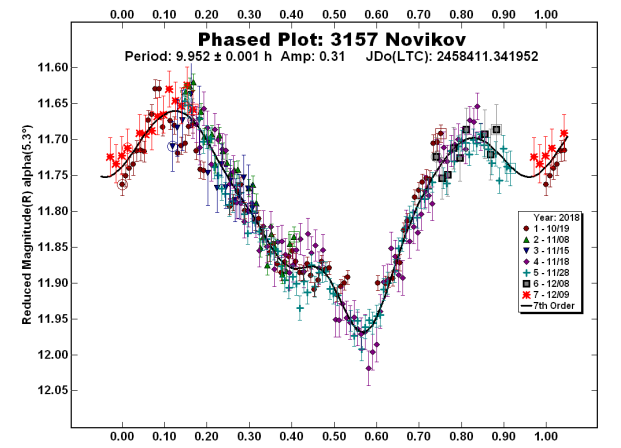
Table 1- Main features of the instruments used at the observatories involved in the research. MCT = Maksutov-Cassegrain; NEW = Newton; SCT = Schmidt-Cassegrain

Data processing and analysis were made with MPO Canopus (Warner, 2018). All the images were calibrated with dark and flat-field frames and converted to R magnitudes using solar-colored field stars from a version of the CMC-15 catalogue distributed with MPO Canopus.

A search through the asteroid lightcurve database (LCDB; Warner *et al.*, 2009) indicates that our results may be the first lightcurve observations and results for these objects, reported as lightcurve photometry opportunities in the Minor Planet Bulletin (Warner *et al.*, 2018).

3157 Novikov (1973 SX3) was discovered on 1973 Sept. 25 by L. Zhuravleva at Nauchnyj and it was named in memory of Aleksej Ivanovich Novikov (1916-1986), Soviet aviator and poet [Ref: Minor Planet Circ. 13175]. It is a main-belt asteroid with the semi-major axis of 3.150 AU, eccentricity 0.147, inclination 7.598 degrees and an orbital period of 5.59 years. Its absolute magnitude is H = 11.6 (JPL, 2019; MPC, 2019) while its diameter is D = 30.522 ± 0.306 km (Masiero *et al.*, 2014). Observations of this asteroid were carried on seven nights, collecting 308 data points. The power spectrum analysis shows several peaks with comparable amplitude. We excluded the solution associated at P=7.462 h since it is mono-modal and therefore much less likely; for similar reason we excluded the solution associated with P=14.926 h since it is tri-modal. Nevertheless, due to the bad observing condition which affected overall data quality, two close peaks still remain respectively around P=9.952 h and P=10.856 h. Both periods yield a bi-modal solution. We chose the bi-modal solution for the rotational period P = 9.952 ± 0.001 h with an amplitude A = 0.31 ± 0.04 mag which gives the least square residuals over the Fourier fit model. However further observations in the future would be greatly welcome to refine the proposed period.

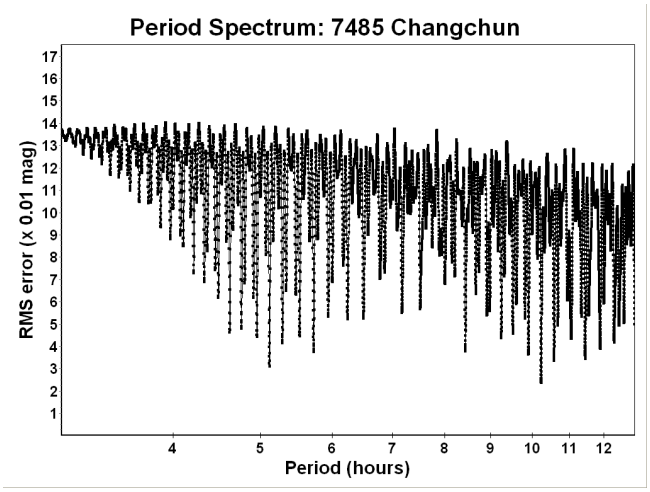


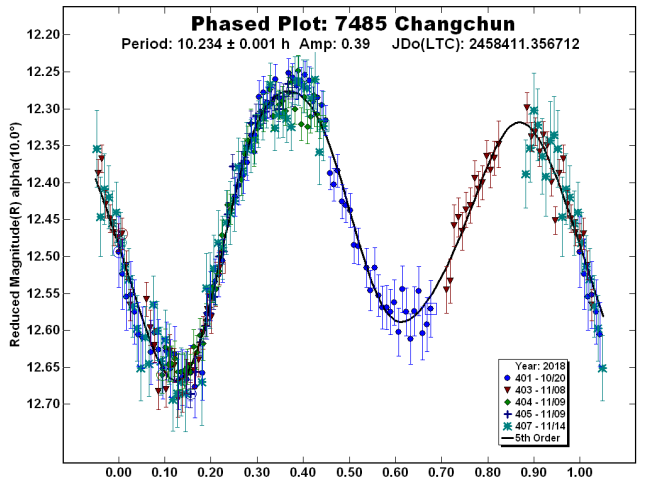


Number	Name	2018/mm/dd	Pts	Phase	L_{PAB}	B_{PAB}	Period(h)	P.E.	Amp	A.E.
3157	Novikov	10/20-12/09	308	4.9,14.5	39	0	9.952	0.001	0.31	0.04
7485	Changchun	10/20-11/14	255	9.8, 9.6	38	-14	10.234	0.001	0.39	0.02

Table II. Observing circumstances and results. Pts is the number of data points. The phase angle is given for the first and last date. L_{PAB} and B_{PAB} are the approximate phase angle bisector longitude and latitude at mid-date range (see Harris *et al.*, 1984).

7485 Changchun (1994 XO) was discovered on 1994 Dec. 4 by M. Koishikawa at the Ayashi Station of the Sendai Astronomical Observatory. It was named after the city of Changhun in China, which is the international sister city of Sendai, Japan, affiliated since 1980 [Ref: Minor Planet Circ. 33788]. It is a main-belt asteroid with the semi-major axis of 2.861 AU, eccentricity 0.197, inclination 13.337 degrees and an orbital period of 4.84 years. Its absolute magnitude is H = 12.0 (JPL, 2019; MPC, 2019) while its diameter is D = 10.787 ± 0.169 km (Masiero *et al.*, 2011). Observations of this asteroid were conducted on five nights, collecting 255 data points. The period analysis shows a bimodal solution for the rotational period P = 10.234 ± 0.001 h with an amplitude A = 0.39 ± 0.02 mag.





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